Title: Whose Data Is It Anyway?

Brief Overview:

The students will have the opportunity to organize, interpret, and display data using a frequency table to create a circle graph. Students will recognize and determine the mean, median, mode, and range for sets of data. Finally, the students will construct a circle graph using the TI-73 calculator.

NCTM Content Standard/National Science Education Standard:

Number and Operation-understand the meaning and effects of arithmetic operations with fractions, decimals, and integers.
Data Analysis- interpret, organize, and display data using frequency tables, circle graphs, and bar graphs.
Algebra- represent and analyze a variety of patterns with graphs, and use proportions to solve problems.

Grade/Level:

Grades 6-7

Duration/Length:

5-6 days (45 minutes blocks)

Student Outcomes:

Students will be able to:

- Organize, interpret, and use relevant information to display data using frequency tables, circle graphs, and scatterplots.
- Select and justify mean, median, mode or range of a data set.

Materials and Resources:

- Construction paper
- Students Resource Sheet #1 (Frequency table worksheet)
- Students Resource Sheet #2 (Whose Data Is It Anyway?)
- Protractor & compass
- M&M packages
- Student Resource Sheet #3 (M&M data worksheet)
- Teacher Resource Sheet #1 (Mean, median, mode and range)
- Student Resource Sheet #4 (Go Figure!)

- Teacher Resource Sheet #2 (scatterplot)
- Teacher Resource Sheet #3
- Student Resource Sheet #5
- Student Resource Sheet #6
- Student Resource Sheet #7
- TI-73 calculator
- Overhead & teacher calculator

Development/Procedures:

Lesson 1

Preassessment – Give a presentation of various graphs from the newspaper. Pre-assess students on their ability to recognize different types of graphs and their ability to match a graph with a given set of data via a short class discussion and completing (SR#2) Worksheet "Whose Data is it anyway ".

Launch – Show students a variety of graphs and give a brief explanation to reinforce when to use and how to identify frequency tables, bar graphs, and circle graphs.

Teacher Facilitation - Ask students for their birth months and create a frequency table for the class on the board. Ask how this birthday data can be used to display a relationship of parts to a whole (create a circle graph). Prompt the class with leading questions such as:

- What is the whole? (total # of students in class)
- What is the amount of different parts or groups? (# of birthdays per month)
- What is the degree portion and percentage of a circle each part of a whole represents? (Use proportions to solve the problem. Ex: x/100 = 3/23, x/360=3/23

Lead the students to understand how to determine the size of the sectors in a circle graph by setting up and solving proportions. If necessary, review how to solve proportions.

Student Application – Distribute a copy of the frequency table worksheet (SR#1) and have the students copy the birth month data from the board. Instruct the students to use the data, and on a separate sheet of paper, calculate the number of degrees and percents each birthday month represents. Have the students solve the proportions in groups to encourage discussion through comparison. When students are finished, teacher should check the calculations with the class to ensure accuracy. Then distribute construction paper and have them draw circles using compasses. Assist with use of compass and have students use the number of degrees for the size of the sector and measure each sector with the protractor. Assist with use of protractor. Instruct the students to label each sector with the degree size and the month it represents. Have them give a proper title that

best illustrates the data for the graph. Actively help and monitor the students' progress.

Embedded Assessment - Have the students make their own frequency tables and circle graphs using their own individual sets of data. Distribute to each student a mini package of M&M's and an M&M data worksheet (SR#3). Make sure they don't eat the candy until all colors are tallied. Have the students complete the worksheet (SR#3). Continue to monitor student work. Collect worksheets when they are finished and grade for accuracy.

Reteaching/Extension –

- Students practice making another circle graph using a frequency table. Data can include the class' favorite types of music, sport, or even foods. The choice can be their own but the data must represent the class information. Reinforce how to solve proportions. Distribute construction paper and compasses.
- Students who make accurate circle graphs with correct measurements and proper labeling can use their own M&M data to make a circle graph using TI-73.

Lesson 2

Preassessment - Give students a set of eight math scores and ask them to find the mean, median, mode, and range of scores. The teacher reviews how to find each measure of central tendency.

Launch – Have the students answer " Which One Am I: mean, median, mode, or range?" based on previous knowledge and given information. Prompt the students with statements from Teacher Resource Sheet #1.

Teacher Facilitation - Work with the class to solve word problems involving statistical analysis. Note that these problems will illustrate how to use measures of central tendency to find and list data. Distribute Student Resource Sheet #4 and allow students to read and think about the problems. Discuss how to solve three problems that students choose.

Student Application - Have the students come to the board to complete the remainder of Student Resource Sheet #4. Monitor and observe students at the board and at their seats.

Embedded Assessment - Take the birthday data from Student Resource Sheet #1 and find each measure of central tendency for the data. Give an explanation of each measure of central tendency as it corresponds to the information from the frequency table.

Reteaching/Extension -

- Have students who need additional practice, complete a practice worksheet that reviews mean, median, mode, and range concepts. Use Student Resource Sheet #5
- Have students continue to use their data from Student Resource Sheet #1 to find the measures of central tendency using the TI-73 calculator.

Lesson 3

Preassessment – Ask the students to write three things they know and three things they want to know about scatter plots. Have the students discuss this with a partner and research in math text. Ask all students to write the following definition for scatter plots - when numerical values are expressed as data points to see if a relationship or correlation exits between two variables. Show the students Teacher Resource #2.

Launch – Ask the students if they would like to know the secret code that magically changes all their grades to A's in all of the teacher's computers! Have the students write down possible answers to the above question.

Teacher Facilitation - Walk around the room to monitor ideas. Allow students to work with a partner to compare thoughts. Guide the students into the idea that the "magic" which turns all grades to A's is study time and effort. Involve the class in sharing a recent grade and the amount of time spent studying. Compile the class data on the board or overhead. Have the students make predictions on possible correlations between a grade earned on a recent test and the amount of time spent studying. Restate the definition of scatterplot and create a scatterplot based on class data to prove or disprove the theory of "magic" behind good grades!

Student Application – Have the students work with the same partner to collect data which will later be used to create a scatterplot. Have them ask a partner how much money they receive for a weekly allowance and how many people are in

their household. Students will use "Show Me The Money" (SR#6) to compile data.

Embedded Assessment – Have the students use information from Student Resource Sheet # 6 (Show Me The Money worksheet) to create a scatterplot. With the class students will discuss what their scatterplot shows about the relationship between allowance money and household size. Note that possible discussion questions can be found on Teacher Resource Sheet #3.

Reteaching/Extension -

- As a class, students will create a new scatterplot using temperature data from July to December. Students will usually be able to see a decline in data.
- Students will use class data from grades/ times spent studying or allowance money/ household size to create a scatterplot on a TI-73 calculator. The TI-73 instruction manual is available from Texas Instruments.

Summative Assessment:

Students will complete the assessment (Student Resource Sheet #7). They will be given a completed frequency table showing students' favorite teachers and they will have to display their data in a circle graph. They must show all proportions used to calculate the degrees and percents for the circle graph. Students will also label and title the circle graph. They must give the measures of central tendency and an explanation of each measure. Students will be given a scatterplot and asked to if there is a relationship between the data and to explain it. They will use their ability to organize, interpret, and use relevant information and apply their knowledge of frequency tables, circle graphs, and scatterplots to complete the assessment.

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CLASS BIRTHDAYS

Name_____

Fill in frequency table using information from class data.

FREQUENCY TABLE

MONTHS	**NUMBER OF STUDENTS**
SEPTEMBER	
OCTOBER	
NOVEMBER	
DECEMBER	
JANUARY	
FEBRUARY	
MARCH	
APRIL	
MAY	
JUNE	
JULY	
AUGUST	

Find the percents and degrees based on the table above. Show all work including all proportions.

Months	Percents	Degrees
SEPTEMBER		
OCTOBER		
NOVEMBER		
DECEMBER		
JANUARY		
FEBRUARY		
MARCH		
APRIL		
MAY		
JUNE		
JULY		
AUGUST		

CLASS BIRTHDAYS

ANSWER KEY

Name_____

Answers are data dependent and will vary from class to class

Fill in frequency table using information from class data.

FREQUENCY TABLE

MONTHS	**NUMBER OF STUDENTS**
SEPTEMBER	
OCTOBER	
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DECEMBER		
JANUARY		
FEBRUARY		
MARCH		
APRIL		
MAY		
JUNE		
JULY		
AUGUST		

Name_____
Date_____Class___

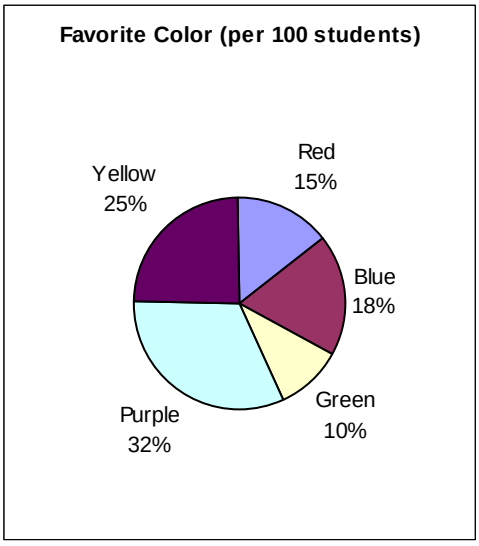
Whose Data Is This Anyway?

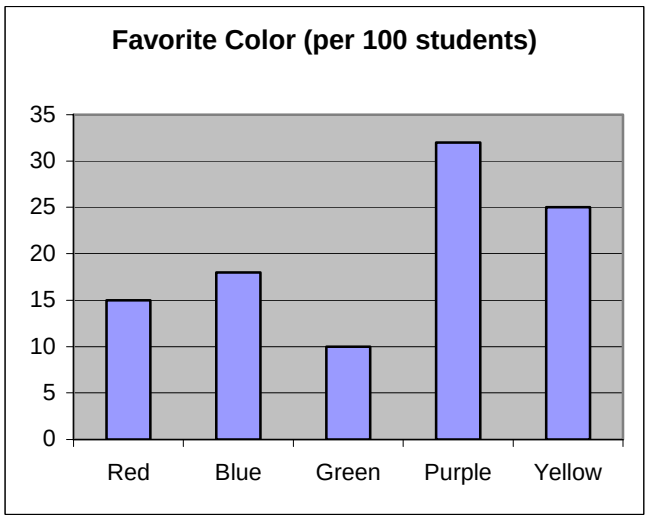
Example of a frequency table.

SURVEY SHEET		
Favorite Color	Tally	Frequency
Blue	𝍸 𝍸 ||	17
Yellow	|||	3
Red	𝍸	5
Orange	𝍸 𝍸	15
Pink	𝍸	5
Green	𝍸 |||	8
Purple	𝍸 ||	7

Compare and contrast the graphs below. Create a table to show the similarities and differences.

Similarities	Differences





Why are the authors able to use a bar graph **and** a circle graph for the same data set?

Take a look at the above circle graph and create fractions from the percents.

Student Resource Sheet #2

Name_____
Date_____Class___

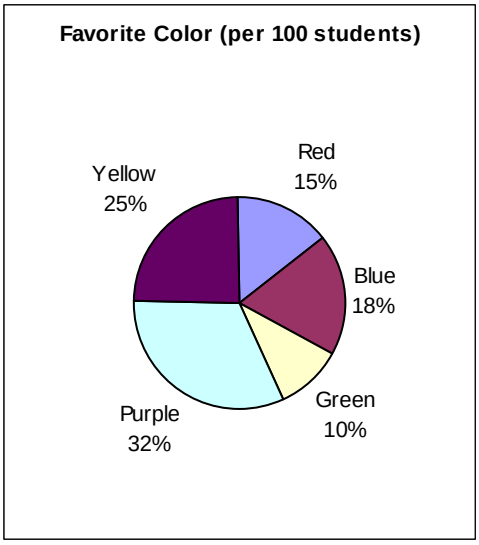
Whose Data Is This Anyway?
ANSWER KEY

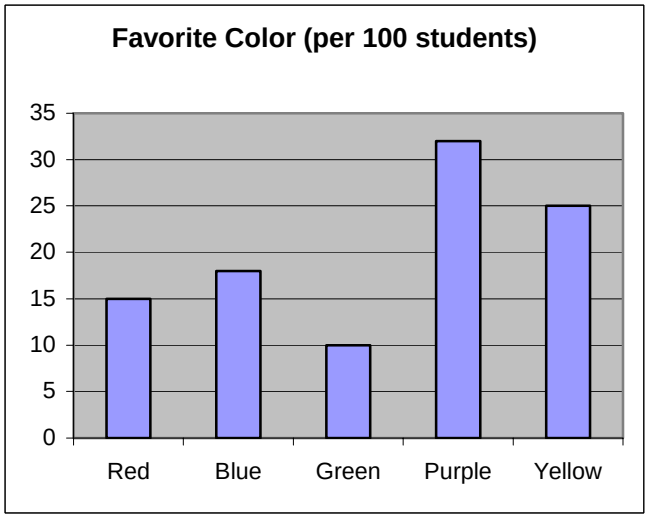
Example of a frequency table.

SURVEY SHEET		
Favorite Color	Tally	Frequency
Blue	𝍸 𝍸 𝍸 ||	17
Yellow	|||	3
Red	𝍸	5
Orange	𝍸 𝍸 𝍸	15
Pink	𝍸	5
Green	𝍸 |||	8
Purple	𝍸 ||	7

Compare and contrast the graphs below. Create a table to show the similarities and differences.

Similarities	Differences
Both represent the frequency of the brand shoes sold	Circle graphs show percentage of total amount (parts to whole)
	Bar graph shows only amount
	Circle graph uses sectors to show frequency
	Bar graph uses bars for frequency





Why are the authors able to use a bar graph **and** a circle graph for the same data set?

Both graphs are able to show the frequency of how often an event occurs.

Take a look at the above circle graph and create fractions from the percents.

Yellow = 25/100 = ¼ Green = 10/100 = 1/10 Purple = 32/100 = 8/25
Red = 15/100 = 3/20 Blue = 18/100 = 9/50

M&M's Data Worksheet

Name_____
Date_____Class____

1) **Make a frequency table to illustrate the number of M&M's of each color.**

2) **Make a circle to illustrate your data. Show proportions needed to determine the number of degrees that will represent each color. Be sure to label your graph. Include all information on your graph.**

3) **Determine the percent of each color in your bag of M&M's.**

Student Resource Sheet #4

Name_____

Go Figure!

Directions. Figure out the missing data given the following clues.

1. Ice Cream Sales

Vanilla	36
Chocolate	40
Coffee	4
Strawberry	6
Peach	?

Given:
median number of sales = 6
range in number of sales = 36
mean number of sales = 18

How many peaches were sold?

2. Grades are due. In order to squeak into the A range you need an 89.5 average. On the last four tests you average an 88. What do you need on the last (next) test to make the A grade? Find the least possible score you can get.

3. Create a list of numerical data such that the median temperature will be an 82 degree day for the last week (7 days), the mode will be 82, the range in temperatures will be 10, and the mean will be 82.

4. Colors of M&M's.

Red	24
Brown	36
Green	14
Yellow	?
Orange	14
Blue	0

Find the range, median, and mode for the M&M's colors, given that the mean is 18.

Median = _____
Range = _____
Mode = _____

How many yellow M&M's are there?

5. List one possible set of data for the sixteen students in Ms. Avargado's class so that the class average would be 88.

6. Given 12, 26, 16, 28, _____, and _____.
   The mean is 19.
   The range is 16.
   The mode is 16.
   The median is 16.

   Find the missing numbers:

7. Given 55, _____, _____, 62, _____, and 77. Data is arranged in order from least to greatest.

   Mode = 55
   Median = 61
   Total of all data is 372

   Find the missing numbers:

   Find the mean:

   Find the range:

Student Resource Sheet #4

Name_____

Go Figure!
ANSWER KEY

Directions. Figure out the missing data given the following clues.

2. Ice Cream Sales

Vanilla	36
Chocolate	40
Coffee	4
Strawberry	6
Peach	?

Given:
median number of sales = 6
range in number of sales= 36
mean number of sales = 18

How many peaches were sold? **4 peaches were sold.**
18 x 5 = 90 total amount
90 - 86 = 4
86 = 36 + 40 + 4 + 6
4, 4, 6, 36, 40

2. Grades are due. In order to squeak into the A range you need an 89.5 average. On the last four tests you average an 88. What do you need on the last (next) test to make the A grade? Find the least possible score you can get.

89.5 x 5 = 447.5
88 x 4 = 352
You need on your next test: 447.5 – 352 = 95.5

8. Create a list of numerical data such that the median temperature will be an 82 degree day for the last week (7 days), the mode will be 82, the range in temperatures will be 10, and the mean will be 82.

77, 82, 82, 82, 82, 82, and 87

4. Colors of M&M's.

Red	24
Brown	36
Green	14
Yellow	Answer below
Orange	14
Blue	0

Find the range, median, and mode for the M&M's colors, given that the mean is 18.

Median = **17**
Range = **36**
Mode = **14**

There are 20 yellow M&M's
List of data: 0, 14, 14, 20, 24, 36

5. List one possible set of data for the sixteen students in Ms. Avargado's class so that the class average would be 88.

Sixteen 88's or any 16 numbers that sum to 1,408 (88 times 16)

6. Given 12, 26, 16, 28, _____, and _____.
   The mean is 19.
   The range is 16.
   The mode is 16.
   The median is 16.

   Find the missing numbers: **16 and 16 (Data is 12, 16, 16, 16, 26, and 28)**

7. Given 55, _____, _____, 62, _____, and 77. Data is arranged in order from least to greatest.

   Mode = 55
   Median = 61
   Total of all data is 372

   Find the missing numbers: **55, 60, and 63**

   Find the mean: **62**

   Find the range: **22**

Student Resource Sheet #5

Name_____

Practice Worksheet
Mean, Median, Mode, and Range

1. What is mean and how do you find it?

2. What is median and how do you find it?

3. What is mode? Give an example.

4. What is range and how do you find it?

5. Use the following set of data to answer each question.
1, 2, 8, 22, 22, 20, and 16

Find:
Range-_____
Mode-_____
Median-_____
Mean-_____

Student Resource Sheet #5

Name_____

Practice Worksheet
Mean, Median, Mode, and Range
ANSWER KEY

1. What is mean and how do you find it?

The mean is the sum of all results included in the sample divided by the number of elements in the sample set. It is also known as the mathematical average.

2. What is median and how do you find it?

The middle value of all the numbers in the sample. It is the value that divides the set of data in half. One must list data in order from least to greatest and select the middle number in an odd set of data or select the two middle numbers and average them in an even set of data.

3. What is mode? Give an example.

Mode is the most frequently occurring data in the data set. There can be one mode, more than one mode, or no mode.

1, 5, 8, 11, 16, 15, 11

11 is the mode of this data set since it occurs most often.

4. What is range and how do you find it?

The difference between the largest and smallest sample in the set.

12, 23, 45, 67, 14, 15 The difference would be 67-12 or 55. You can also express the range as 12 to 67.

5. Use the following set of data to answer each question.
1, 2, 8, 22, 22, 20, and 16

Find:
Range- **15**
Mode- **22**
Median- **22**
Mean- **13**

Calculations: 1 + 2 + 8 + 22 + 22 + 16 = 91 91/7 = 13

Student Resource Sheet #6

Show Me the Money

Data Table tallies for scatterplot

Weekly allowance Amounts	Number of people in household
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	
16.	
17.	
18.	
19.	
20.	

Student Resource Sheet #7

Name_____

Test

The students in a middle school have been asked to vote for their favorite teacher. The frequency tables below show the results of the voting.

1. Using the frequency table below calculate the degrees and percents for each teacher. Show all work.

Favorite Teacher	**Number of students**
Mrs. Billings	15
Mr. Herot	19
Mr. Benny	9
Ms. Kelly	23
Mrs. Nigel	7
Mrs. Nelson	2

FavoriteTeacher	Degrees	Percent
Mrs. Billings		
Mr. Herot		
Mr. Benny		
Ms. Kelly		
Mrs. Nigel		
Mrs. Nelson		

Show proportions work here.

Give the following for the above information.

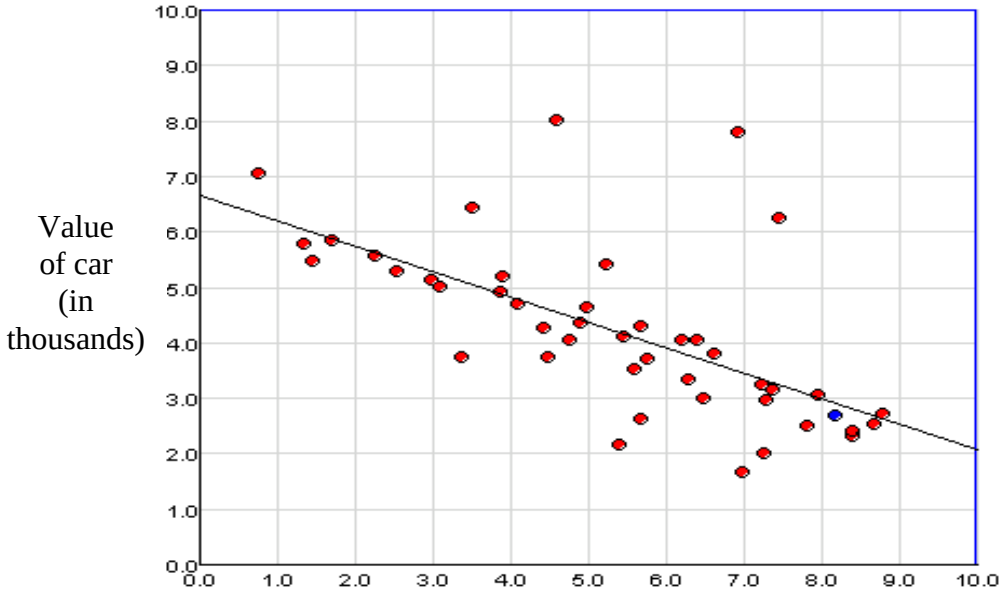
- Mean_____
- Median_____
- Mode_____
- Range_____

2. Which measure of central tendency would you choose to best represent the data? Why?

3. Label and title a circle graph below showing the information from the above frequency table. Use a protractor to keep your graph accurate.

The scatter plot below shows data relating the value of a car to its age. Use this scatter plot to answer questions four through eight.

Age of Car vs. Value of Car



4. What two sets of data are being compared?

5. Is there a relationship between the data?

6. What type of trend is this called?

7. What is the value of the car when it is four years old?

8. What predictions could you make when the value of the car is $15,000?

Student Resource Sheet #7

Name_____

Test
Answer Key

The students in a middle school have been asked to vote for their favorite teacher. The frequency tables below show the results of the voting.

1. Using the frequency table below calculate the degrees and percents for each teacher. Show all work.

Favorite Teacher	**Number of students**
Mrs. Billings	15
Mr. Herot	19
Mr. Benny	9
Ms. Kelly	23
Mrs. Nigel	7
Mrs. Nelson	2

FavoriteTeacher	Degrees	Percent
Mrs. Billings	**72**	**20**
Mr. Herot	**91.2**	**25.3**
Mr. Benny	**43.2**	**12**
Ms. Kelly	**110.4**	**30.6**
Mrs. Nigel	**33.6**	**9.3**
Mrs. Nelson	**9.6**	**2.6**

Show proportions work here.

Example: 15/75 = *x*/360 gives 72 degrees for Mrs. Billings
15/75 = *x*/100 gives 20 percent for Mrs. Billings

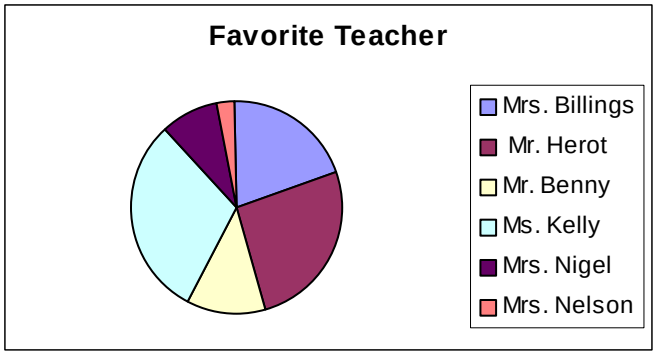
Give the following for the above information.

- Mean ____**12.5**____
- Median ___**12**___
- Mode ____**no mode**____
- Range ___**21**___

2. Which measure of central tendency would you choose to best represent the data? Why?

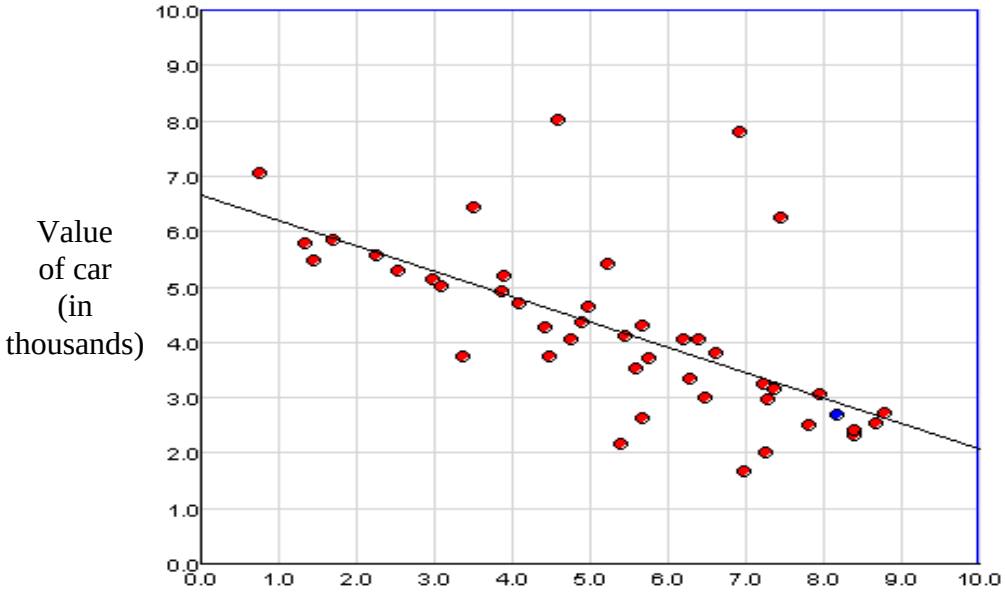
The mean and the median because the average number of votes was 12.5. There are just as many teachers that have 12 or more votes as teachers that have 12 or less votes. Both mean and median are close to the same value.

3. Label and title a circle graph below showing the information from the above frequency table. Use a protractor to keep your graph accurate.



The scatter plot below shows data relating the value of a car to its age. Use this scatter plot to answer questions four through eight.

Age of Car vs. Value of Car



4. What two sets of data are being compared?
   Age of car and value of car

5. Is there a relationship between the data?
   Yes, as the value of the car increases, the age of the car decreases

6. What type of trend is this called?
   This is a negative correlation since one set of data is increasing while the other set of data is decreasing.

7. What is the value of the car when it is four years old?
   Approximately $4,800.

8. What predictions could you make when the value of the car is $15,000?
   The car could be anywhere between brand new (0) and 1 year old.

Use the following statements to prompt the students.

1. In a survey to determine favorite radio stations, the third station listed received 50 points. (median)

2. More students received a score of 80 than any other score. (mode)

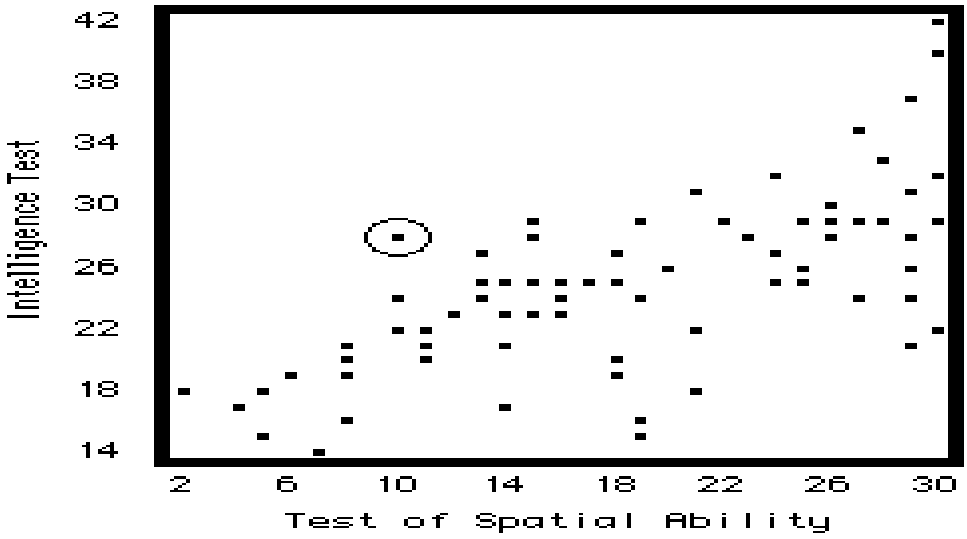
3. The doctor found that the average of all 35 weights was 120lbs. (mean)

4. The lowest score is 64% and the highest score is 102%. The difference is 38. (range)

5. The average time for a 400 meter race was 1:43 but none of the runners actually ran for that length of time.(mean)

Scatterplots

A scatterplot shows the scores of subjects on one variable plotted against their scores on a different test.



1. **What are the two sets of data being compared in the above scatterplot?**
   Intelligence test scores & spatial ability test scores

2. **What are the X and Y axes labeled?**
   Same as #1

3. **Can you name three possible relationships that may exist in a scatterplot?**
   Positive, negative, and no relationship

4. **Can you identify which one is evident in the above scatterplot?**
   Positive

Teacher Resource
Show Me The Money

1. What kind of trends do they notice?

   Data dependent

2. Can we predict, based on data from eight schools, what the results from this class might be?

   Answers may vary

3. What do you notice about the relationship between size of families and the amounts of allowance for students in this class? Explain.

   Answers will vary